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May 5, 2016

VIA ELECTRONIC FILING AND U.S. MAIL

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101-2147

Re: In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. § 216B.2422, Subd. 3

Exceptions to the Report of the Administrative Law Judge – Carbon Dioxide

MPUC Docket No. E999-CI-14-643
OAJ Docket No. 80-2500-31888

Dear Mr. Wolf:

In connection with the above-referenced docket, please find enclosed for filing, on behalf of Great River Energy, Minnesota Power, and Otter Tail Power Company ("GRE/MP/OTP"), the following documents:

1. GRE/MP/OTP Exceptions to the Report of the Administrative Law Judge – Carbon Dioxide

2. Affidavit of Service

Thank you for your attention to this matter. Please feel free to contact me at (612) 492-6853 if you have any questions related to this filing or if additional information is required.

Very truly yours,

DORSEY & WHITNEY LLP

/s/ Phil Steger

Phil Steger
Associate

Enclosures

cc: Service List

STATE OF MINNNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

Beverly Jones Heydinger	Chair
Nancy Lange	Commissioner
Dan Lipschultz	Commissioner
Matthew Schuerger	Commissioner
John Tuma	Commissioner

In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. § 216B.2422, Subd. 3	MPUC Docket No. E-999/CI-14-643 OAH Docket No. 80-2500-31888

Great River Energy, Minnesota Power, and Otter Tail Power Company Exceptions to the Report of the Administrative Law Judge

Carbon Dioxide

May 5, 2016

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I. INTRODUCTION

Great River Energy, Minnesota Power, and Otter Tail Power Company (collectively, "GRE/MP/OTP") respectfully submit these Exceptions to the Administrative Law Judge's ("ALJ") Findings of Fact, Conclusions of Law and Recommendation ("ALJ Report") in the Carbon Dioxide ("CO_2") phase of the above-captioned matter. At the outset, GRE/MP/OTP would like to recognize and express our appreciation for the thoughtful and thorough comments provided by the Agencies and other parties in this proceeding.

GRE/MP/OTP are electric utilities which together serve approximately 865,000 customers throughout most of Minnesota. We are committed to providing reliable and affordable electricity service to our customers. We recognize the relationship between CO_2 emissions and climate change, and we each have taken significant steps to decrease our dependence on CO_2-emitting, coal-generated electric power. We also recognize the significant role played by the quantification of environmental cost values ("ECV") in the State of Minnesota's resource planning process.

GRE/MP/OTP are also committed to being productive participants in this proceeding. To that end, we have joined with the Minnesota Large Industrial Group to sponsor the testimony of Dr. Anne Smith, an economist and expert in the use of integrated assessment modeling ("IAM"), who has been working on issues relating to climate change for more than 25 years. Her testimony – including her 100+ page expert report – has been offered to address not only the issues relating to the use of the Federal Social Cost of Carbon ("FSCC") to update Minnesota's CO_2 ECV, but to find the best approach to modifying the FSCC so it complies with Minnesota statutory requirements and prior Commission decisions.

We submit these exceptions because we respectfully disagree with the ALJ's recommendation that the Commission adopt "the Federal Social Cost of Carbon as reasonable and the best available measure to determine the environmental cost of CO_2."[1] We find the FSCC, even when modified to reduce the time horizon by 100 years, is neither reasonable nor the best available measure to determine the environmental cost of CO_2. Indeed, we contend the ALJ's recommended approach is both contrary to statutory requirements and prior Commission decisions, and it is not supported by a preponderance of the evidence. We view with special concern the recommendations to extend the time horizon beyond 2100, to evaluate the "last ton," to include a discount rate below 3 percent, and to defer any action on accounting for leakage, which is inevitable and likely to be very significant.

For the reasons set forth below, we submit a few exceptions to certain key conclusions and corresponding findings of fact set forth in the ALJ Report.

At the crux of the matter, we believe the ALJ is recommending the Commission, in the interest of providing a "full accounting" of damages, adopt highly speculative damage estimates

[1] *In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. § 216B2422, subd. 3*, Findings of Fact, Conclusions, and Recommendations: Carbon Dioxide Values at 123, Recommendation 1, Docket No. E-999/CI-14-643 (Apr. 15, 2016) ("ALJ Report").

that disregard both (1) the statutory requirement to "quantify and establish" environmental cost values and (2) the Commission's 1997 order requiring that values be based on substantial evidence and be conservative, so the use of the values will not distort resource planning decision-making. The ALJ is recommending that the Commission abandon the crucial principle, set out in the Commission's 1997 order, that there is a "a point on the uncertainty continuum where it becomes infeasible to quantify environmental costs even though the Commission is convinced such costs exist."[2] In other words, at some point, even when it is likely that future damages exist, it may no longer be reasonable or even practicable to quantify such damages because those estimates cannot be supported by sufficient evidence.

In at least two major respects, the ALJ is recommending the Commission reverse the approach it has taken in the past to establish the CO_2 ECV. First, the FSCC is not based on a traditional damage cost approach. In its October 15, 2014 order referring this matter to the Office of Administrative Hearings ("OAH"), the Commission explained that it prefers the damage cost approach "because it appropriately focuses on the actual damages from uncontrolled emissions."[3] But the evidence in this proceeding establishes that the damage functions used in the IAMs DICE, PAGE and FUND[4] to estimate the FSCC are only, as stated in Finding 124 of the ALJ Report, "simplified formulas which calculate a monetary estimate of the loss of value to society directly from temperature change levels." The Interagency Working Group's ("IWG") use of the IAMs, as all witnesses admitted, results in many damage estimates, especially in the period after 2100, that are highly speculative and lacking significant scientific evidentiary support. Second, as brought out in the testimony of Dr. Smith, the IWG did not use the same economic framing assumptions for time horizon, discount rate, and marginal ton as the Commission has previously used to establish the CO_2 ECV. Rather, the IWG used different assumptions which substantially raise the level of uncertainty associated with the calculated values. In the final analysis, the IWG does not truly quantify values, nor even estimate them with sufficient precision. Therefore, the use of the FSCC to establish the CO_2 ECV neither complies with the environmental cost statute nor aligns with past Commission practice.

The Commission is well-aware of the concerns held by GRE/MP/OTP regarding the use of the FSCC to establish the CO_2 ECV. And the record evidence clearly establishes that calculating the ECV based on the FSCC requires the Commission to rely on a "best guess" – according to the Clean Energy Organizations' ("CEOs") own witness – about the relationship between higher temperatures and the economy.[5] For this reason, we do not believe it has been shown, based on a preponderance of the evidence, that the FSCC provides a reasonable measure to establish Minnesota's CO_2 ECV.

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[2]Ex. 306, *In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Chapter 356, Section 3*, Order Establishing Environmental Cost Values at 30, Docket No. E-999/CI-93-583 (Jan. 3, 1997) ("1997 Commission Order").

[3]*In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minn. Stat. § 216B2422, subd. 3*, Notice and Order for Hearing at 4, Docket No. E-999/CI-14-643 (Oct. 15, 2014) ("Notice and Hearing Order").

[4]Dynamic Integrated Climate and Economy ("DICE") model, Policy Analysis of the Greenhouse Effect ("PAGE") model, and Climate Framework for Uncertainty, Negotiation and Distribution ("FUND") model.

[5]Hearing Transcript, Vol. 1, 124:7-13 (Polasky).

However, if the Commission is inclined to rely on the FSCC to update the CO_2 ECV, the preponderance of the evidence clearly establishes that a modified version of the FSCC, consistent with the economic framing assumptions that have previously been used by the Commission, is a better alternative. More specifically, the evidence supports a recommendation that the Commission adopt a modified version of the FSCC to determine the CO_2 ECV incorporating the following economic framing assumptions:

1) A time horizon extending to the year 2100;

2) Use of an average cost approach to calculate marginal ton;

3) 3.0 percent and 5.0 percent discount rates; and

4) Global damages.

One of the most compelling facts established in this proceeding is that the primary difference between the measure used by the Commission to establish the current CO_2 values and the measure used by the IWG is the economic framing assumptions, rather than any significant advancement in scientific understanding.[6] The damage functions used by the IWG are based upon quantitative relationships between temperature changes and economic damages that are almost identical to those relied upon by the Commission to establish the CO_2 values in 1997.[7] The record, in other words, is lacking in evidence to support the claim made by petitioner CEOs that the current CO_2 values are no longer supported by scientific evidence.[8] Instead, the record establishes the difference between the CO_2 values resulting from the IAM modelling performed by the IWG and the Commission's current values is largely the result of choices that the IWG made regarding the framing assumptions used in running the models rather than a deeper scientific understanding. In fact, in undisputed testimony, Dr. Smith observed, that "[i]f the IWG analysis were to be done with analytic framing consistent with Minnesota's 1997 decisions, their range of SCC estimates would be much closer to the environmental cost values approved by the Commission in 1997 than to the values recommended by the Agencies."[9]

Overall, most of the findings made by the ALJ are not in dispute. The primary issues are whether certain key conclusions are supported by the evidence and whether the recommendations comply with law and Commission precedent. If the Commission decides to use the FSCC to determine the ECV, GRE/MP/OTP recommend the Commission modify the

[6] Ex. 302 at 6-9 (Smith Report) ("Differences Between IWG's SCC Estimates and Those Adopted by the Commission in 1997").
[7] *Id.* at 23-25.
[8] In referring this matter for a contested case hearing, the Commission "determined that the scientific evidentiary support for the existing values had been reasonably called into question …" Notice and Hearing Order at 2. Only a very limited amount of the evidence offered by either the Agencies or the CEOs in support of their proposals relates to the scientific evidence supporting the existing values or any proposed values. Rather, the overwhelming amount of the evidence relates to whether the updated values should be calculated based on the use of three IAMs and the framing assumptions (e.g., time horizon, discount rates, etc.) employed by the IWG.
[9] Ex. 302 at 9 (Smith Report).

economic framing assumptions so they align with the assumptions previously adopted by the Commission to meet statutory standards.

II. APPLICABLE LAW AND COMMISSION PRACTICE

A. The ECV Statutory Requirement

Minn. Stat. § 216B.2422 requires utilities to file resource plans with the Commission setting out resource options to meet the service needs of their customers. Subdivision 3(a) of Section 216B.2422 (emphasis added) provides the Commission "shall, ***to the extent practicable, quantify and establish*** a range of environmental costs associated with each method of electricity generation." Utilities are required to use the values established by the Commission, in conjunction with other factors, in certain Commission proceedings including resource planning and certificate of need dockets.

B. The Commission's Prior CO_2 Decision

In the first proceeding in the 1990s establishing a CO_2 ECV, the Commission concluded that the terms "quantify and establish" and "to the extent practicable" require that values adopted possess an adequate quantitative evidentiary basis and not be overly speculative.[10] Although the Commission acknowledged uncertainty cannot be entirely eliminated from methodologies for calculating environmental cost values for emissions, it rejected proposed values based on highly speculative estimates and it insisted that available data "provide a sufficiently reliable basis for establishing environmental damage."[11]

In the earlier proceeding, ALJ Allan Klein undertook a substantial analysis of the legal requirements and the policy concerns relating to the establishment and quantification of the CO_2 ECV. The Commission adopted the analysis in Judge Klein's report and the Commission's order was affirmed by the Minnesota Court of Appeals.[12] We believe the legal and policy analysis adopted by the Commission in the earlier proceeding remains relevant and appropriate today.[13]

In his analysis, Judge Klein held the term "practicable" as used in the Environmental Cost Statute, Minn. Stat. § 216.2422, subd. 3(a), effectively describes the evidentiary standard to

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[10]Ex. 306 at 27 (1997 Commission Order).
[11]*Id.* at 26.
[12]*Quantification of Environmental Costs*, 578 N.W.2d 794, 800 (Minn. Ct. App. 1998).
[13]We object to the conclusion set out in the ALJ's memorandum that "there is no explicit language in the Commission's 1997 Order approving Judge Klein's reasoning regarding adopting conservative values." ALJ Report at 126 (Memorandum). Among other things, in its 1997 order, the Commission held that "[t]o the extent not separately addressed in this Order, the Commission adopts the decisions and analysis in the ALJ's Report." Ex. 306 at 34 (1997 Commission Order). We thus believe there is explicit language in its 1997 Order that the Commission agreed with and was embracing Judge Klein's analysis of the relevant legal requirements and policy concerns. When the Commission's 1997 Order is read in its entirety, we find this is the most reasonable conclusion. Indeed, the Commission found the "ALJ's calculation" was "well-reasoned and firmly based in the record." *Id.* at 26.

be applied by the Commission to establish the CO_2 ECV. In Findings 29 and 30, Judge Klein explained:

> 29. The ALJ believes that the term "practicability," as it is used in the Environmental Cost Statute, must be construed according to its common and proper usage. *See* Minn. Stat. § 645.08 (1994). The common and approved usage of "practicability" is "feasible," or capable of being accomplished. *See* Webster's New Universal Unabridged Dictionary (2d Ed. 1983). As will be discussed more fully below, there are some pollutants which are impossible to value, in the sense that there is just not enough data in this record to establish a value for them. As the ALJ interprets the term practicability, it is not practicable for the Commission to establish values for those pollutants at this time.
>
> 30. The Environmental Cost Statute, Minn. Stat. § 216B.2422, subd. 3(a) does not require that the Commission unconditionally adopt environmental cost values. Rather, if the parties proposing values fail to prove, by a preponderance of the evidence, that it is practicable to both quantify and establish environmental cost values for the various pollutants, the Commission need not, and indeed cannot, adopt environmental cost values.[14]

Judge Klein went on to grapple with the uncertainty that inevitably arises in connection with the establishment of environmental cost values. In a series of findings, Judge Klein elaborated:

> 31. A major issue in this proceeding is the approach that should be taken in the face of uncertainty. At some point, the degree of uncertainty associated with a proposed value becomes so great that there is insufficient evidence to meet the preponderance standard, and the value cannot be adopted.
>
> 32. The quantification of environmental costs necessarily involves the consideration of scientific evidence that generally does not provide definitive answers, forcing the Commission to make inferences or judgments about the environmental cost question.
>
> 33. A variety of economic methodologies can be employed to transform the scientific evidence of costs into dollar figures, and these methodologies produce varying estimates. Whatever methodology is applied, it necessarily involves making judgments and estimates in the face of some uncertainties.[15]

Later in his report, Judge Klein put this analysis into practice when he recommended the Commission adopt "conservative values":

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[14]Ex. 305, *In the Matter of the Quantification of Environmental Costs Pursuant to Laws of Minnesota 1993, Ch. 356, Section 3*, Findings of Fact, Conclusions, Recommendation and Memorandum at 10, Docket No. E-999/CI-93-583 (Mar. 22, 1996) ("1996 ALJ Report").
[15]*Id.* at 11.

> The ALJ recommends that the Commission adopt conservative values in this proceeding because, despite the attention utility regulatory commissions have recently afforded environmental impacts, the quantification of environmental costs is still in its infancy. While using reasonably accurate estimates is better than imputing no values, not all estimates are better than zero. For instance, valuing an impact at more than twice its "true" residual damage may lead to a worse allocation of resources than imputing no value. In other words, the possibility of utilities paying more for resources than their environmental benefits justify is just as bad as paying less than their benefits justify. Given the current uncertainty regarding the estimation process, overestimating the damages is a distinct possibility. The Commission would then be forced to order reductions in future proceedings. This "yo-yo" pattern of values would be more confusing and disruptive than a pattern of gradual increases. A better alternative is to err on the side of conservatism initially, then increase the values gradually if better information in the future confirms the need for higher values.[16]

In its order in the earlier proceeding, the Commission agreed with Judge Klein's approach, interpreting the statute to require that the Commission "quantify values only if (to the extent) it is feasible (practicable) to do so."[17] In language virtually identical to that recommended by the ALJ, the Commission determined that "there is a point on the uncertainty continuum where it becomes infeasible to quantify costs ***even though the Commission is convinced that such costs exist****."*[18] The Commission adopted the range of values for CO_2 recommended by the ALJ, along with the principle that conservative values are to be applied in the face of uncertainty, concluding that the "ALJ's calculation is well-reasoned and firmly based in the record."[19]

III. STANDARD OF REVIEW AND BURDEN OF PROOF

ALJ Schlatter determined that the appropriate standard in this proceeding is the preponderance of the evidence.[20] The preponderance of the evidence standard is satisfied by proof which leads the finder of fact to find the existence of the contested fact or issue is more probable than not. A party proposing the Commission adopt an ECV (or range of values) for CO_2, such as the FSCC, bears the burden of proving by a preponderance of the evidence that the value or values proposed are reasonable and the best available measure.

Thus, the proponents of the adoption of the FSCC must present evidence demonstrating that it is more probable than not that the FSCC is reasonable and the best available measure of the CO_2 ECV. They cannot meet this burden unless they satisfy the "practicability of quantification" standard the Commission has determined to be required by the statute. They

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[16] *Id.* at 17-18.
[17] Ex. 306 at 31 (1997 Commission Order).
[18] *Id.* at 30.
[19] *Id.* at 26.
[20] *In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statute 216B.2422, Subdivision 3*, Order Regarding Burdens of Proof at 2-3, Docket No. E-999/CI-14-643 (Mar. 27, 2015); *see also* ALJ Report at 115, Conclusion 3.

must do more than convince the Commission the damages they propose to include in the costs exist; they must demonstrate, based upon a preponderance of the evidence, that the costs of the damages are sufficiently certain that they may be practicably quantified.

IV. THE FSCC IS NOT BASED UPON A TRADITIONAL DAMAGE COST APPROACH

As noted in Conclusion 4 of the ALJ Report, the Commission's Notice and Order for Hearing in this proceeding required the parties to evaluate ECV using a damage cost approach "because [this approach] appropriately focuses on actual damages from uncontrolled emissions."[21] Then, in Conclusion 6, the ALJ concludes "the FSCC is a damage-cost approach consistent with the Commission's Notice and Order for Hearing in this docket."[22]

We respectfully object to Conclusion 6. The evidence in this proceeding establishes that the FSCC does not meet the Commission's definition of a damage cost approach as one that "focuses on actual damages from uncontrolled emissions." As reflected in Finding 164, the "Agencies maintained that the damage function of an IAM is the economic value associated with particular groups of impacts at a specific point in time as a function of the increase in global temperature occurring at that time."[23] In other words, the damage functions used in the IAMs contain highly aggregated, simplified formulas that do not model relationships between warming effects and damages. This is not the traditional type of damage cost approach that "focuses on actual damages from uncontrolled emissions." This departure from the traditional damage cost approach renders the IAMs less reliable because the resulting calculations suffer from significant uncertainty, speculation, and lack of information.

This issue comes most clearly into focus in the testimony of Dr. Smith.[24] In her Direct Testimony, Dr. Smith draws upon her deep experience in the operation and use of IAMs to assess climate change:

> Q. DOES A SCC ESTIMATE REFLECT A DAMAGES COST APPROACH GIVEN THAT IT WAS CALCULATED USING IAMS CONTAINING DAMAGE FUNCTIONS?

[21] ALJ Report at 115, Conclusion 4; Notice and Hearing Order at 4.
[22] ALJ Report at 115, Conclusion 6.
[23] *Id.* at 50, Finding 164.
[24] Dr. Smith testifies on behalf of GRE, MP, OTP, and the MLIG. Dr. Smith is a Stanford-trained Ph.D. economist, modeler and decision analyst, who has focused throughout her career on environmental policy matters, including climate change, air pollution, and environmental risk management. Dr. Smith has nearly thirty years of experience working with IAMs and she assisted the EPA on one of the early IAMs used for climate change policy analysis. Dr. Smith led a team in 2013 and 2014 that prepared a study of the damage functions in the IAMs used in creating the IWG's FSCC. She authored a report on uncertainties in estimating an FSCC using the IAMS. And she prepared a technical assessment of the EPA's use of the FSCC values in its regulatory impact analysis of the Obama Administration's proposed Clean Power Plan. Ex. 300 at 3:11-12, 6:12-14, 17-19, 20-22, 7:7-8:9 (Smith Direct); Ex. 301 (Smith Curriculum Vitae).

A. No, not as that term has traditionally been understood. A traditional damages cost approach for climate change would first ascertain climatic changes from projected emissions, then estimate the physical impacts on a variety of resources and amenities due to the climatic changes, and finally estimate the societal (monetized) value of the physical changes in the resources/amenities. As I explain in detail in my report (AES-Direct-2), the IAMs largely skip the detailed steps involved in determining how particular physical resources will be impacted by climatic changes. For most of their damage valuations, they predict change in societal value directly from temperature increase or some other measure of climatic conditions. Only portions of the IAMs' SCC damage estimates are based on specific resource impact projections. This aggregation of the logical steps into a reduced form function is not necessarily inappropriate when the structure of the underlying relationships is well understood. However, in the case of the IAMs, the damage functions are based on limited data regarding the damages resulting from small changes in temperature, and they make large extrapolations to much higher-than-observed temperature changes. The lack of specificity of the dose-response relationships that are implicit in those extrapolations -- and the degree to which the IWG's SCC estimates are based on the extrapolated portions of the damage functions -- does imbue the IWG's estimates with a degree of speculation that is problematic in a situation such as Minnesota's, which seeks values that have an evidentiary foundation and are based on conservative assumptions.[25]

In her expert report, Dr. Smith provides flow diagrams in two figures to show the difference between a traditional damage cost approach (Figure 1) and the simplified, aggregated damage cost approach used in the IAMs (Figure 2)[26]:

[25]Ex. 300 at 19:4-20:5 (Smith Direct).

[26]Ex. 302 at 23 (Smith Report). In her expert report, Dr. Smith addresses in detail the differences between damages functions typically used in damage cost analyses and the damage functions used by the IWG for calculating the FSCC. *Id.* at 20-25.

Figure 1. Climate Change IAM Structure Following a Traditional Damage Function Method

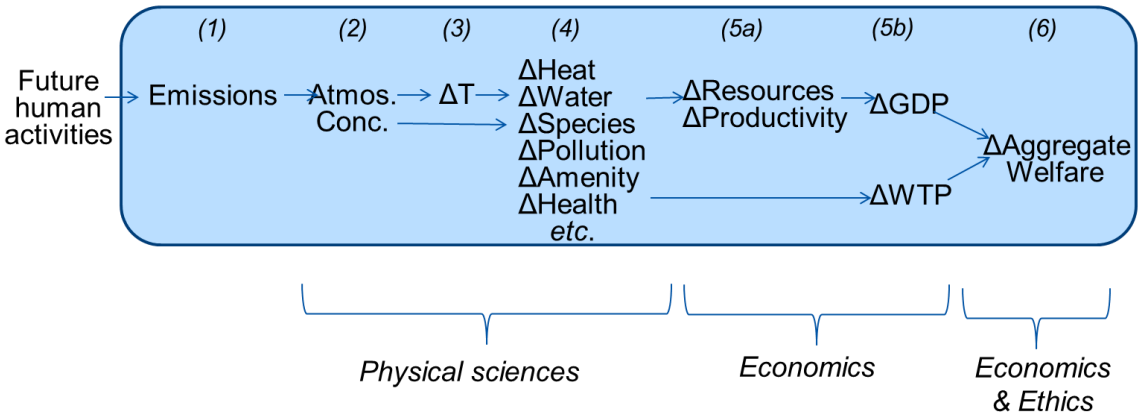
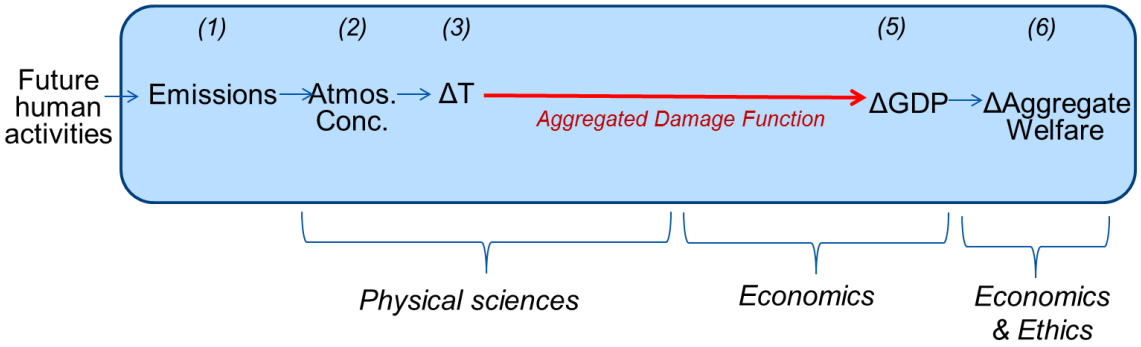


Figure 2. Structure of Climate Change IAMs Used for Estimating SCCs



Why is this important? We believe that before the Commission can adopt the FSCC in any form it must understand how the IWG used the IAMs to produce the CO_2 ECV. To determine whether the FSCC is reasonable and the best available measure to determine the CO_2 values, the Commission must carefully evaluate the methodology and the major assumptions employed in the modeling undertaken by the IWG. We believe this scrutiny is critical because the threshold question in this proceeding is whether the IAMs used by the IWG to develop the FSCC provide the level of precision in the quantification of ECV required for resource planning.

Under such scrutiny, we believe the adoption of the FSCC, especially without significant modifications, is neither reasonable nor the best available measure to update the CO_2 values. Based on the evidence, we believe three findings, which are not in dispute, support this conclusion. First, since the IAMs rely on aggregate damages, it is difficult to know precisely what types of damages are included in an FSCC estimate.[27] The IAMs "do not produce a descriptively realistic, spatially disaggregated response of climate change impact and damage variables," because they "do not provide damage estimates for each physical change."[28] This is another way of saying the IAMs do not follow a traditional cost damage approach and it underscores why this point is so important to the Commission's deliberations. The EPA 1983

[27] ALJ Report at 45-46, Findings 145 and 149 (citing Ex. 302 at 4-5, 23 (Smith Report)).
[28] *Id.* at 45, Finding 145 (citing Ex. 302 at 23 (Smith Report)).

Guidelines for Regulatory Impact characterizes the damage cost approach as one based upon an effect-by-effect logical chain, in which specific forms of adverse physical effects have been quantified and then assigned an economic valuation.[29] At the heart of a damage cost function analysis is a step which estimates "the physical impacts to a range of resources and amenities human beings value that are considered to be potentially impacted by changing climate."[30] Economic relationships are then employed to estimate the change in societal value of those resource changes.[31] In all, the process is one of identifying discrete, measurable, quantifiable impacts of rising temperatures on resources and amenities, assigning economic value to those impacts, and then adding up the values assigned to each impact to arrive at the total estimate of damages. The step of identification and quantification of damages is crucial to ensuring there is solid empirical foundation underneath the ultimate cost calculation. But this step is not included in the damage functions used by the IWG.

Second, as the ALJ stated in Conclusion 9, the IAMs' damage functions themselves are derived from a very limited number of studies "which were neither up-to-date nor comprehensive."[32] The proponents of the FSCC have not offered any means to address this deficiency. In addition, the outdated studies used to develop the damage functions used by the IAMs examine the economic impact of warming up to only 3 degrees Celsius, which means IAM developers must extrapolate from these impacts to speculate about the impacts of temperatures above 3 degrees Celsius. Similar to the ALJ, the IWG itself has recognized that the representations reflected in the IAMs' damage functions are "incomplete and highly uncertain," and require "thorough review."[33] Based on this reason alone, the Commission should not adopt the FSCC.

And third, as the ALJ recognized in Conclusion 41, "the task of predicting the SCC is ***highly uncertain*** because it is an exercise in predicting impacts of CO_2 emissions many years into the future."[34] Indeed, every expert who appeared in this proceeding, including those offered by the Agencies and the CEOs, as well as those experts cited from the academic literature, share the view that the FSCC values are ***highly uncertain***. For example, the following expert opinions are part of the record:

- Dr. Robert Pindyck, Professor at MIT, has written that IAM-based analyses create an "illusory and misleading" appearance of knowledge and precision about the benefits of reducing CO_2 emissions.[35] Dr. Pindyck writes: "When it comes to the damage function, we know almost nothing, so developers of IAMs can do little

[29] *Id.*, Finding 146 (citing Ex. 302 at 21 (Smith Report)).
[30] Ex. 302 at 22 (Smith Report).
[31] *Id.*
[32] ALJ Report at 116, Conclusion 9.
[33] Ex. 100 (Polasky), Schedule 2 at 9 (IWG Technical Support Document – February 2010).
[34] ALJ Report at 121, Conclusion 41 (emphasis added).
[35] Ex. 302 at PDF page 188 (Smith Report for American Petroleum Institute) (quoting R. Pindyck, "Climate Change Policy: What Do the Models Tell Us", *Journal of Economic Literature* 860, 867 (2013).

more than make up functional forms and corresponding parameter values. And that is pretty much what they have done."[36]

- Lord Nicholas Stern, Professor at London School of Economics, has explained that analysis done with IAMs has "very serious weaknesses" and "must not be taken too literally."[37] Accordingly, "[IAM-derived] estimates of marginal social costs of damages provide a very weak foundation for policy."[38] *Id.* Although IAM methodology does "have an important supplementary place in an analysis," Lord Stern warns that "all too often it has been applied naively and transformed into the central plank of an argument." *Id.*

- Dr. Stephen Polasky, the CEOs' witness, testified that "[u]ncertainty plays a major role in this process [and e]stimating the SCC is difficult in part because we are attempting to predict impacts far into the future for temperature changes that are potentially outside the range of recent historical experience."[39] Dr. Polasky also noted that each of the IAMs upon which the FSCC is based depend on a "best guess" of future damages.[40]

- Dr. Smith observed that IAMs contain "extrapolations" that are "highly speculative and not supported by the facts, available evidence, or peer-reviewed analyses."[41] These extrapolations from the EMF projects are "not evidentiary-based."[42] They are both "not self-consistent" and "inconsistent regarding physical facts."[43]

- Mr. Nicholas Martin agrees that the FSCC is inherently "uncertain and speculative", depending on a chain of assumptions, each of which is "uncertain, and uncertainty builds from one step to the next."[44]

In spite of the overwhelming evidence establishing the uncertainty associated with the values produced by the IAMs, the ALJ concludes that it is "reasonable" for the Commission to rely on the IAMs to establish the CO_2 values.[45] The ALJ supports this conclusion as follows: first, the use of the IAMs is "consistent" with a damage-cost approach; second, the IAMs' damage functions are "based on empirical studies";[46] and third, the "the FSCC underestimates

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[36] *Id.*
[37] Ex. 230 at 95 (Bezdek Report) (quoting Nicholas Stern, Lecture, "The Economics of Climate Change," American Economic Review: Papers and Proceedings, Vol. 98, No. 2, p. 3 (2008)).
[38] *Id.*
[39] Ex. 100 at 15:22-16:1 (Polasky Direct).
[40] Hearing Transcript, Vol. 1 at 124:7-13 (Polasky).
[41] Ex. 302 at 68 (Smith Report).
[42] *Id.* at 67.
[43] *Id.* at 68.
[44] Ex. 600 at 3 (Martin Direct).
[45] ALJ Report at 116, Conclusion 8.
[46] *Id.*, Conclusion 10.

the negative effects that increased warming will have on human health" and "the IAMs damage functions do not account for a significant number of important environmental impacts which will occur as a result of climate change."[47] These reasons given by the ALJ to support the conclusion that it is reasonable to rely on the IAMs to establish the CO_2 ECV are not supported by a preponderance of the evidence. First, the ALJ does not conclude that the IAMs "focus on actual damages from uncontrolled emissions" as the Commission required, but only that the IAMs are "consistent" with a traditional damage-cost approach. Second, although the ALJ concludes the use of the IAMs is reasonable because they are based on empirical studies, she also concludes those studies are limited, out-of-date, and not comprehensive.[48] Finally, the ALJ concludes that the FSCC "underestimates" damages.[49] By doing so, the ALJ acknowledges that the CO_2 ECV cannot be quantified with sufficient evidence, and thus cannot satisfy the ECV statutory standard.

V. THE USE OF RISK PREMIUMS IS NOT CONSISTENT WITH THE ECV STATUTE OR PREVIOUS COMMISSION DECISION

As discussed in Section IV, the witnesses offered by the Agencies and the CEOs, Dr. Polasky and Dr. Hanemann, admit that the role uncertainty plays in the FSCC values is "major"[50] and that the resulting uncertainty is "large".[51] But they also attempt to convert this evidentiary liability into an asset. Whereas the Commission in the past has required sufficient evidence to establish "conservative" values, the CEOs and the Agencies now urge the Commission to stand this approach on its head. They ask the Commission to embrace rather than reject uncertainty and to knowingly and deliberately set the new CO_2 ECV even when there is a lack of sufficient evidence to quantify those values. This approach, of course, is not only inconsistent with the Commission's past practice, it is directly contrary to the statutory requirement demanding that the Commission "to the extent practicable, quantify and establish" ECVs.

We object to Conclusion 43, where the ALJ concludes "an initially higher SCC" should be established because of the uncertainties associated with estimating CO_2 damages. The ALJ is recommending the adoption of the modified FSCC because it contains a risk premium to cover damages that cannot be quantified with sufficient evidence. This is contrary to the Environmental Cost Statute, including the past interpretation of the statute by the Commission.

In Section II of the Memorandum, the ALJ explains her approach:

> While estimating damages, particularly far into the future, remains a difficult problem full of uncertainty, there is now undeniable evidence that CO_2 emissions are already having a dramatic impact on the Earth and its climate. A modern proverb graphically illustrates the dichotomy of conservativism in the face of climate change: "When the last tree is cut down, the last fish eaten, and the last stream poisoned, you will realize that you cannot eat money." In establishing cost

[47] *Id.*, Conclusions 11-12.
[48] *Id.*, Conclusion 9.
[49] *Id.*, Conclusion 11.
[50] Ex. 100 at 15:20-22 (Polasky Direct).
[51] Ex. 802 at 45:1-9 (Hanemann Surrebuttal).

> values in this proceeding, the Administrative Law Judge respectfully recommends that the Commission consider applying conservative values to the well-being of future generations and the planet needed to sustain them, rather than primarily to the financial cost of providing that well-being.[52]

In the earlier proceeding, the Commission rejected an argument, similar to the one now being made by the Agencies and the CEOs, that the CO_2 ECV may be based on assumptions lacking empirical basis that increase cost calculations in order to account for damages that are presumed to exist but have not been quantified. ALJ Klein summarized this "risk premium" argument as follows:

> In the alternative, [Minnesota Pollution Control Agency expert] Ciborowski assumed environmental damage of 2% of global GDP [gross domestic product]. … Ciborowski refers to this assumption as the "higher damage function". Ciborowski testified that the higher 2% figure was justified because various costs (such as costs to unmanaged ecosystems, species diversity, and air pollution) were omitted from the studies upon which he relied; because assumptions were made about linear warming; and because certain "inherent risks" of global warming were excluded; however, these omitted costs, assumptions, and risks were never valued by anyone, including Ciborowski.[53]

Both ALJ Klein and the Commission declined to adopt values based on grounds that "certain 'inherent risks'" of global warming were not included in the ECV calculation. Adopting ALJ Klein's conclusion, the Commission found that "the assumption that damages can be estimated at 2 percent of global gross domestic product ("GDP") is factually unsupported by the record and is highly speculative given the available evidence."[54]

In the past, the Commission has also recognized that it cannot "alter the legislature's directive that the Commission is to quantify values only if (to the extent) it is feasible (practicable) to so."[55] The Commission has recognized that the inability to quantify damages for a pollutant does not mean the effects of the pollutant will be ignored; it only means those damages cannot be monetized.[56] When damages cannot be quantified, the Commission is still free to consider unquantified impacts on a qualitative basis.[57]

For these reasons, we object to Conclusion 43, as well as to Conclusions 8, 11, 12, and 13, which find that the use of IAMs is reasonable because the FSCC understates the full costs of CO_2 emissions. We object to these conclusions because the incorporation of a risk premium (i.e., allowances for damages that cannot be identified and quantified with sufficient evidence) is contrary both to the statutory requirement that the Commission must "quantify" environmental cost values and to Commission practice.

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[52] ALJ Report at 127 (Memorandum).
[53] Ex. 306 at 35 (1996 ALJ Report).
[54] Ex. 305 at 27 (1997 Commission Order); *see also* Ex. 305 at 36 (1996 ALJ Report).
[55] *Id.* at 31.
[56] *Id.*
[57] *Id.*

The use of the FSCC, as proposed by the Agencies and the CEOs and as recommended by the ALJ, is in effect a request for a more stringent greenhouse gas policy. We recognize their concerns and are working with the Commission to address them. But for purposes of this proceeding and the updating of the CO_2 ECV, the Commission is required to quantify damages and cannot rely on damages based on excessive speculation.

VI. THE PREPONDERANCE OF THE EVIDENCE ESTABLSHES THAT A BETTER ALTERNATIVE WOULD BE TO ADOPT THE FSCC AMENDED TO USE THE ECONOMIC FRAMING ASSUMPTIONS PREVIOUSLY USED BY THE COMMISSION

The adoption of the FSCC would be a major departure from the measure currently used by the Commission to determine the CO_2 ECV in at least two major respects. First, the FSCC places great faith in three IAMs – DICE, FUND, and PAGE – developed in the 1990s to estimate GDP losses caused by global temperature changes (rather than actual damages from uncontrolled emissions). Although some may find it tempting to see the FSCC as a pre-fabricated, ready-to-go measure to set ECVs, the preponderance of the evidence shows it is poorly suited for site-specific resource planning.[58] Second, as discussed in greater detail below, three of the four key economic framing assumptions used in the FSCC differ from those used by the Commission when it previously determined the range of CO_2 values is not consistent with Commission precedent.

We object to the Conclusions and Recommendations in the ALJ Report to the extent they call for economic framing assumptions that depart from the Commission's current practice. The record evidence establishes by a preponderance of the evidence that the use of the Commission's current economic framing assumptions will significantly and effectively reduce excessive speculation and extrapolation in establishing CO_2 ECV. The record is lacking in evidence to justify a departure from the current framing assumptions. And a departure from those assumptions allows for such a level of uncertainty that it becomes infeasible to quantify

[58]The IWG never intended the FSCC to be used for site-specific utility resource planning. In fact, the IWG itself has pointed out that it did not address the use of the FSCC estimates outside the federal regulatory context, such as in NEPA analysis, state-level decision making, and "pricing" carbon in the marketplace. Ex. 101 (Polasky Rebuttal), Schedule 1 at 41 (IWG Response to Comments). In Conclusion 46, the ALJ concludes "the FSCC could provide the Commission with the information it requires to implement Minn. Stat. § 216B.2422, subd. 3." ALJ Report at 122, Conclusion 46. But the ALJ does not address the expert testimony offered by Xcel Energy and GRE/MP/OTP, among others, that the FSCC is not suited for the finer-grained decision-making involved in utility resource planning in Minnesota, "where the consequences of doing too little or too much [would be] disproportionately concentrated on one narrowly-defined sector and population." Ex. 304 at 14:10-14 (Smith Surrebuttal). In their testimony, Dr. Smith and Mr. Martin both point out that the imprecision associated with the use of the FSCC is less of a concern in regulatory impact analysis than in resource planning, where the use of the FSCC could drive resource choices that have significant customer cost impacts and are not easy to reverse. Ex. 300 at 19:15-20:5 (Smith Report): Ex. 302 at 74-75 (Smith Report); Ex. 304 at 14:10-14 (Smith Surrebuttal); Ex. 600 at 6:3-27, 12:22-14:9 (Martin Direct); Ex. 601 at 20:1-25, 21:14-22:4 (Martin Rebuttal); Ex. 602 at 7:1-8:7 (Martin Surrebuttal).

environmental costs based on sufficient evidence. This results in values that do not comply with statutory requirements.

A. Time Horizon

The values that the Commission currently uses are based upon economic framing assumptions that (i) estimate damages until 2100, (ii) apply discount rates of 3.0 and 5.0 percent (iii) calculate damages based on the damage estimated for an average ton, and (iv) consider global damages.[59] The only one of these framing assumptions used by the IWG is global damages. For the others, the IWG used different economic framing assumptions. In each case, the IWG's different assumptions significantly increase the amount of uncertainty associated with the resulting damage calculations.

By requesting the adoption of the FSCC, the Agencies and the CEOs have proposed to push the time horizon out by two hundred years to 2300. On this important point, the ALJ concludes the Agencies and the CEOs do not carry their burden. After receiving the evidence, the ALJ concludes "the CEOs and Agencies failed to demonstrate that the IWG's prediction of damages from the year 2100 to the year 2300 meet the same standards of reliability as the IWG's predictions of damages from the present to the year 2100."[60] The ALJ points out that the "IWG used the peer-reviewed EMF-22 scenarios, which were constructed through the year 2100."[61] Beyond 2100, the ALJ concludes "[t]he IWG extrapolated the EMF inputs to the year 2300 based on limited data, without the benefit of peer review."[62]

In her memorandum, the ALJ points out that "[t]he best evidence supports recalculating the damages to 2100."[63] The ALJ explains her analysis and the competing considerations that faced her – and now face the Commission – in establishing the CO_2 ECV in the face of major uncertainty:

> The Commission is faced with a decision regarding the time horizon which requires a balancing of evidentiary and policy considerations. The evidence is clear that carbon remains in the atmosphere, cumulates, and will continue to affect the climate for hundreds of years to come. The dilemma facing the Administrative Law Judge, and the Commission, is a certainty that damages will continue to occur after 2100, coupled with a significant drop-off in the reliability of how to predict those damages after 2100. Predicting future damages is not at all certain, even based on the peer-reviewed EMF-22 scenarios designed to project to the year 2100. The IWG's extrapolation beyond that time frame with the scenarios is more tenuous. Yet, the certainty that damages are there remains.

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[59] Ex. 306 at 24-26 (1997 Commission Order).

[60] ALJ Report at 119, Conclusion 32. In fact, no witness even attempts to defend the reliability of the damage estimates beyond 2100. Witnesses, including Dr. Polasky and Dr. Hanneman, testify that damage estimates after 2100 are speculative and based on increasing levels of uncertainty. *See supra* nn.30-39.

[61] *Id.*

[62] *Id.*

[63] ALJ Report at 129 (Memorandum).

> The best evidence supports recalculating the damages to the year 2100. On the other hand, there is a strong argument that, knowing the damages continue, it is reasonable to include damages until the year 2200. This compromise position would account for the ongoing damages yet limit, to some extent, the compounding effect of continuing the calculation for another 100 years. The Agencies' and the CEOs' experts did not perceive the level of speculation between the EMF-22 projections from the present until 2100 and from 2100 until 2300 to be significantly different in terms of reliability. While the Administrative Law Judge cannot credit the projections for the two periods equally in an evidentiary sense, neither can she completely discount that latter. Therefore, the Administrative Law Judge recommends recalculating the FSCC based on IAMs with inputs through the year 2200.[64]

We do not believe the ALJ's approach – including the recommended year 2200 compromise – goes far enough to comply with state law. Because the record establishes that damage estimates beyond 2100 are based on extrapolation, it follows that damages beyond 2100 can be neither quantified nor supported by sufficient evidence in a manner required by the environmental cost stature. Thus, we object to Conclusion 35, and we urge the Commission to use a time horizon of 2100.

B. Marginal Ton

We have two principal objections regarding the ALJ's conclusions regarding marginal ton.

First, we object to Conclusion 29 where the ALJ concludes that counting the last ton of CO2 is reasonable and the best available means to calculate the ECV. Under this last ton approach, the ALJ explains that she is attempting to account fully for the cumulative impact of emissions.[65] But the "last ton" approach overstates the impact of emissions in Minnesota by treating those emissions as if they will be produced after all other tons of carbon, including all those emitted elsewhere, are released into the atmosphere.[66] For example, the FSCC value for 2020 is based on the damages resulting from the concentration of CO_2 expected to exist by 2020, all CO_2 emissions produced in 2020, and all CO_2 emissions projected to occur in the model's scenarios from 2020 to 2300.[67] A ton of CO_2 emitted in Minnesota is thus treated as the most damaging ton in history, because it is treated as a ton emitted when atmospheric CO_2 levels are at their highest; that is, after all other tons that will be emitted between now and the end of the time horizon have been emitted.[68] The "last ton" approach thus greatly overstates the damages from Minnesota emissions as compared to a more balanced average cost approach.[69]

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[64] *Id.* at 129-30.
[65] *Id.* at 119, Conclusion 29.
[66] Ex. 300 at 15:1-9, 20:7-21:3 (Smith Direct).
[67] *Id.* at 20:18-21.
[68] Ex. 302 at 54 (Smith Report) ("[T]he IWG's efforts to value the last ton's damage is conceptually inconsistent with the realities of climate change risks, as no single ton in any single

Second, we object to Conclusion 28 insofar as the ALJ concludes that GRE/MP/OTP has not demonstrated an average ton approach was used in the first ECV matter. In the earlier case, the Commission established the CO_2 ECV based on the approach offered by the MPCA's witness, Peter Ciborowski.[70] In his findings, which were adopted by the Commission, ALJ Klein confirmed Mr. Ciborowski's "method involved estimating long-term discounted global costs based on the existing economic literature and dividing by long-term CO_2 emissions to arrive at an ***average cost per ton***."[71] In addition, in her testimony in this case, Dr. Smith described the approach taken by Mr. Ciborowski,[72] and no party objected to this testimony. On this matter, we believe there is no serious issue of fact and it is possible for the Commission to verify that an average cost approach was used in the earlier case.

The preponderance of the evidence establishes that the "average ton" is a better alternative because it treats Minnesota's emissions as no better or no worse than emissions in other jurisdictions. This is the Commission's current approach, and the proponents of the FSCC fail to prove the Commission should replace it with the "last ton" approach.

C. Discount Rates

Regarding discount rates, GRE/MP/OTP agree with Conclusion 14 that it is reasonable to apply the 3 and 5 percent discount rates.[73] These same empirically-based rates were used in determining the current CO_2 ECV.[74]

However, in Conclusion 18, the ALJ finds that the 2.5 percent rate, which was not used in the earlier matter, should now be used along with the 3 and 5 percent discount rates.[75] We believe this approach introduces a degree of speculation that is not consistent with statutory requirements or the approach previously taken by the Commission. In the earlier case, the Commission was also urged to use rates below 3 percent based on intergenerational considerations but it declined to do so based on a lack of evidentiary support for such rates in the record.[76] Once again, we believe the use of a discount rate below 3 percent is not supported by a preponderance of the evidence.

As the ALJ recognizes in Finding 183, Dr. Smith points out in her testimony that a 2.5 percent discount rate for the FSCC is based upon a "subjective and prescriptive view" that people living today should not discount the consumption of future generations in the same

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year can be viewed as the *last* ton in an intertemporal projection of emissions that *cumulatively* determines the temperature changes that drive the present value of damage estimates.").

[69]Ex. 300 at 15:5-9 (Smith Direct); Ex. 601 at 45:13-46:16 (Martin Rebuttal). A last ton approach will distort the impact of Minnesota emissions even more egregiously if leakage is not taken into account.

[70]Ex. 306 at 27 (1997 Commission Order).

[71]Ex. 305 at 34, ¶ 103 (1996 ALJ Report) (emphasis added).

[72]Ex. 302 at 53-54 (Smith Report).

[73]ALJ Report at 116.

[74]Ex. 306 at 27 (1997 Commission Order).

[75]ALJ Report at 117.

[76]Ex. 306 at 27 (1997 Commission Order).

manner in in which they discount their own within-generation consumption choices.[77] But the principal problem with this approach is that once you decide not to set the discount rate based upon actual human behavior, you enter into a realm of uncertainty that fails to conform to the evidentiary standards required for setting Minnesota's ECV.[78]

The use of a prescriptive discount rate is also problematic because it distorts decision-making. As Professor Mendolsohn testified, by choosing a lower discount rate for CO_2, distinct from other public investments, the IWG sets a different, more attractive "price of time" for climate change mitigation than for other public investments.[79] But there is no theoretical support for preferring climate change mitigation to other types of public investment,[80] and no explanation was given why it is socially desirable for CO_2 mitigation to have a lower rate of return than public investments in national security, health, education, safety or infrastructure.

For these reasons, we submit the ALJ incorrectly concludes that proponents of the FSCC carried their burden of proving by a preponderance of the evidence that the use of a 2.5 percent discount rate is reasonable.

VII. THE PREPONDERANCE OF THE EVIDENCE ESTBALISHES THE SOCIAL COST OF CARBON SHOULD ACCOUNT FOR LEAKAGE

There is no dispute that leakage occurs and reduces the efficacy of CO_2 reductions in emissions from Minnesota. Nevertheless, the ALJ concludes that calculating leakage is not a part of these proceedings and recommends that the Commission open a separate investigation into measuring leakage and whether and how to take leakage into account.[81] We respectfully disagree. Although we recognize that specific leakage percentages should not be developed in this proceeding for later application in resource planning and certificate of need dockets,[82] the preponderance of the evidence supports requiring that the ECV established in this docket be applied to ***net*** emissions reductions.[83] The underlying objective of establishing the CO_2 ECV is the actual reduction of carbon emissions in the global emissions inventory, not merely the reduction of emissions from generating sites in Minnesota.[84] The record shows there is no

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[77] ALJ Report at 54, Finding 183; Ex. 300 at 24:9-12 (Smith Direct); Ex. 302 at 87 (Smith Report).

[78] Ex. 302 at 85-89, 91 (Smith Report); *see also* Ex. 303 at 28:10-23 (Smith Surrebuttal) ("The IWG's decision to include a 2.5% discount rate is based on considerations that do not rest on empirical evidence, but rather includes giving weight to ethical considerations that cannot be ascribed any evidentiary basis."). In contrast, the 3 and 5 percent discount rates used by the IWG are based on observations of how people actually value future benefits when making financial decisions. Ex. 100 (Polasky), Schedule 2 at 18, 20, 23 (IWG Technical Support Document – February 2010); Ex. 303 at 33:1-3 (Smith Surrebuttal).

[79] Ex. 214 at 11 (Mendelsohn Direct); Ex. 217 at 7:142-7:149 (Mendelsohn Rebuttal).

[80] *Id.*

[81] ALJ Report at 121, 124, Conclusion 40 and Recommendation 2.

[82] Ex. 300 at 35:5-7 (Smith Direct), Finding 293.

[83] Ex. 300 at 28:4-11, 34:8-18, 35:5-10 (Smith Direct); Ex. 302 at 9, 11, 13, 41, 47, 49, 100-02 (Smith Report); Ex. 401 at 10-11 (Gayer Surrebuttal); Ex. 602 at 53:7-25 (Martin Rebuttal).

[84] *See* Ex. 302 at 9-10 (Smith Report).

benefit to reductions of emissions in Minnesota if the amount of those reductions is emitted in another jurisdiction which does not implement emissions controls.[85]

VIII. CONCLUSION

The only proposals offered for updating the CO_2 ECV are based on the FSCC or variations of the FSCC. Consequently, based on the record, we suggest that the Commission has three basic options:

(1) adopt the FSCC, as proposed by the Agencies and the CEOs,

(2) adopt a modified version of the FSCC whereby certain framing assumptions used by the IWG are adjusted, such as in the versions recommended by the ALJ (adjusting the time horizon to 2200) or by GRE/MP/OTP (adjusting the economic framing assumptions to align with the assumptions made by the Commission in the first CO_2 ECV case), and

(3) decline to change the methodology now used by the Commission to establish the CO_2 ECV.

For the reasons set forth in the ALJ's Report, as well as in these exceptions, we believe that the Agencies and the CEOs fail to establish by a preponderance of the evidence that their preferred option – the pure version of the FSCC – is reasonable and the best available measure of the environmental cost of the CO_2.

For the reasons set forth in these exceptions, especially because it would be contrary to law and inconsistent with the Commission's past practice, we further believe that the approach recommended by the ALJ is not supported by a preponderance of the evidence.

Under the circumstances, we recommend the Commission decline to change the methodology that it now uses to update the CO_2 ECV due to the excessive uncertainty and speculation associated with use of the FSCC. In the alternative, we recommend the Commission adopt a modified version of the FSCC based upon the same economic framing assumptions used by the Commission in setting the current CO_2 ECV – a time horizon extending to 2100, use of an average cost approach to calculate marginal ton, 3.0 percent and 5.0 percent discount rates, and global damages.

Dated: May 5, 2016

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[85]Ex. 302 at 100 (Smith Report); Ex. 602 at 28:10-14 (Martin Rebuttal).

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ATTORNEYS FOR GREAT RIVER ENERGY, MINNESOTA POWER, AND OTTER TAIL POWER COMPANY

AFFIDAVIT OF SERVICE

In the Matter of Investigation into Environmental and Socioeconomic Costs
Under Minnesota Statute Section 216B.2422, Subdivision 3

STATE OF MINNESOTA)
) ss.
COUNTY OF HENNEPIN)

I, Phil Steger, hereby certify that on the 5th day of May 2016, on behalf of Great River Energy, Minnesota Power, and Otter Tail Power Company, I electronically filed true and correct copies of the following documents with the Minnesota Public Utilities Commission ("PUC"):

1. Exceptions to the Report of the Administrative Law Judge – Carbon Dioxide

2. Affidavit of Service.

The documents were filed through the PUC's eFiling system, and that eFiling system will provide service to those on the attached list who have selected electronic service.

/s/ Phil Steger
Phil Steger

Subscribed and sworn to before
me this 5th day of May 2016:

Notary Public, State of Minnesota
My Commission Expires: 1/31/2020

PAULA R BJORKMAN
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SaGonna	Thompson	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List
Erin	Vaughn	evaughn@shb.com	Shook, Hardy &Bacon L.L.P.	2555 Grand Blvd. Kansas City, MO 64108	Electronic Service	No	OFF_SL_14-643_Official CC Service List

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Colin	Wicker	wicker.colin@dorsey.com	Dorsey & Whitney LLP	50 6th Street South Suite 1500 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Alexis	Williams	williams@fresh-energy.org	Fresh Energy	408 St. Peter St Suite 220 St. Paul, MN 55102	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Cam	Winton	cwinton@mnchamber.com	Minnesota Chamber of Commerce	400 Robert Street North Suite 1500 St. Paul, Minnesota 55101	Electronic Service	No	OFF_SL_14-643_Official CC Service List
Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_14-643_Official CC Service List